

Mastin (W^{m.}m.)
Compliments of the Author.

Venous-Blood Tumors

OF THE

VAULT OF THE CRANIUM

COMMUNICATING WITH THE

INTRA-CRANIAL VENOUS CIRCULATION,

ESPECIALLY THROUGH THE MEDIUM OF THE

SUPERIOR LONGITUDINAL SINUS.

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By WILLIAM ~~X~~, MASTIN, M.D.,
OF MOBILE.

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THE SUPERIOR LONGITUD-
INAL SINUS.

By WILLIAM M. MASTIN, M. D.,

OF MOBILE.

INJURIES and diseases of the venous division of the blood-carrying system of vessels are found, upon attentive examination, to occupy a much more general and conspicuous position in the extensive domain of pathology than lesions of their better-known arterial associates; for, excluding their very manifest physiological importance, with those prominent disorders of which they are the evident and well-attested seat, the light of modern medical and surgical science has clearly demonstrated that the veins are intimately connected with, or play a most active rôle in, numerous maladies which, until recently, were classed among the obscurities of medicine.

Not the least in this series are infarctions, metastases, and many forms of pyaemia and septicaemia, in which these conduits are now recognized as furnishing the principal elements in the formation of, and ready channels for floating along, the embolic masses, or disseminating the septic material throughout the system at large.

Notwithstanding this late acquisition to our knowledge, it must be conceded that clinical investigation, together with anatomical¹ and experimental research, have not yet accom-

¹ Breschet's *Système Veineux*, published in 1824, although elaborate, was far from being complete—leaving marked deficiencies; and it has not been followed by any very extensive inquiry in this direction.

A number of excellent and important papers on the venous circulation and distribution in certain regions have appeared, however, from time to time in various medical periodicals, all of which have been valuable topographical additions to our anatomical information in this department.



plished in a full measure for the veins, *cæteris apribus*, what has been obtained for other structures and tissues composing the human frame; and, therefore, even to-day there are many facts relative to this portion of the circulation, around which still hangs the veil of doubt and speculation; and especially so as to the degree and character of traumatism which can be sustained by or inflicted upon large venous branches, trunks, and sinuses, compatible with the preservation of their functional integrity or the health and life of the individual affected.

Illustrative of this is the single example of the employment of ligation in the treatment of vein-wounds.¹ This procedure was viewed in former days with such disfavor (witness, as a few among many distinguished authors, the cautions of such men as Langenbeck, Lisfranc, and Pirogoff) as to be declared always attended by dangerous, if not fatal consequences—either immediate or secondary; and, indeed, so deeply and firmly rooted in the professional mind of these times was this, which may be justly designated positive superstition, that it became a dogma which, upheld principally by a blind adherence to traditional doctrines, is still accepted with much of its original delusiveness,—largely pervading, as it does, the teachings, and governing the practice of some of the ablest surgeons of this decade.

Of all the organs and regions of the body, the veins and sinuses of the brain and its enveloping tunics have been, perhaps, the most neglected.²

Just at this period, therefore, when a surgical revision of the subject of head-injuries (fractures of the skull and cerebral injury) seems to be peculiarly called for, and to demand an examination of more than ordinary care,—and even such a reviewing is already passing through the hands of the profession,—any marked point connected therewith, particularly if

¹ Mention must not be omitted of the papers of Dr. S. W. Gross (*Amer. Jour. Med. Sci.*: 1867) demonstrating the safety of the deligation of veins; and especially the statistical collections and experiments in lateral closure of incomplete vein-wounds by Nicaise, Braun, and more recently Pilcher, and others; includin^z the published clinical details of many cases, by both American and European surgeons, where lateral ligation was practised successfully in wounds of large veins.

² The latest important contributions to the cerebral veins and sinuses with which I am acquainted are the admirable papers of Heubner, Duret, Langer, Rüding^r, and Trolard with the recent brochure on *The Veins of the Human Brain and its Envelopes* (1884), by Wm. Brownинг, of Brooklyn.

associated with the intra-cranial circulation, should be of more than common interest; and, in this connection, the lesion which forms the theme of this essay presents features doubly attractive, since in it are involved both of the above mentioned conditions.

Before entering into a full examination of the subject, I shall narrate briefly the history of the case which first engaged my attention and directed inquiry into the literature of the malady, as affording an appropriate prelude and explanatory introduction to a general consideration of the subject.

This case is as follows:

On September 10, 1881, I had the opportunity of examining Mr. W. D. Penton, a native of Florida, who visited Dr. C. H. Mastin for professional advice relative to a tumor of the head, of several years' duration, and which had become a source of considerable annoyance and solicitude.

Inquiry elicited this history: He is a man 35 years of age, laborer, married, and the father of several healthy children. His own health has always been good, and, with the exception of frequent dull headaches, is still excellent. In appearance, also, he is moderately robust and vigorous. There is no history or evidence of hereditary disease, nor is he cognizant of ever having sustained a severe fall, or any blow or wound upon the head. When a youth, he contracted a gonorrhœa, and also suffered from a venereal ulcer on the glans penis; but now the closest questioning and examination fail to discover the slightest indication of systemic infection. About five years ago he chanced to feel a small lump, or wen-like mass, equal in bulk to a common acorn, on the left and posterior portion of scalp. This was painless, compressible—disappearing entirely on pressure, but partially redilating with the removal of the compressing force—and gave so little trouble as to render its discovery the result of the merest accident.

His attention being once called to the existence of the growth, frequent handling followed, and hence he is able to assert that the tumor gradually enlarged, until it attained its present dimensions of a large chestnut, although he is equally assured it has remained *in statu quo* for the past eighteen months. As mentioned above, his only inconvenience is an harrassing headache, which is fleeting in character—coming and going—and which he thinks is connected with the tumor, but he is unable to trace a positive or direct association therewith. He is confident, however, that the condition and size of the growth is

materially influenced by a hearty meal, the recumbent and stooping postures with the head below the level of the remainder of the body, and after muscular exertion; under all of which circumstances it becomes full, tense, and decidedly augmented in volume.

A careful examination, whilst sitting upright, now reveals only a slight fullness of the scalp in the locality indicated, which readily, though somewhat slowly, disappears upon lightly-made pressure by the fingers or hand, and leaves in its stead an indentation or depression in the skull, occupying the upper extremity of left arm of lambdoidal suture. This depression is quite perceptible, and is of a triangular, funnel shape, being wider at margins (large enough to admit the tip of the index finger) and gradually narrowing down, apparently, to a single small aperture where it penetrates the bone and emerges into the cranial cavity. When the sac is evacuated by compression, the tegumentary covering is regular, lax, movable, and moderately thin, and through which the surface of the bone is felt to be smooth, and devoid of all perceptible inequalities or roughnesses. Reversing this position, and causing the patient to recline or stoop, with his head hanging down, a round, distinct tumor is found to rise and expand steadily over the site of the indentation. It is soft, elastic, conveying to the touch the sensation of an ordinary haematoma or blood tumor of the scalp, not discolored, and is easily reducible, after the emptying of which, the osseous depression is again perceived. Dizziness and vertigo result if this posture, with the head lowered, is maintained for a short time. Pressure causes neither pain nor the least uneasiness—cerebral or otherwise. There is no pulsation or bruit; no appreciable effect produced by the respiratory act; but I find that any interruption to the blood-current through the jugulars increases the tension of the tumor.

The surrounding integument is unimplicated, and there is no other lesion of the head. There is disturbed cardiac action, but both heart and lungs are without organic disease. The ophthalmoscope shows the papilla and general fundus of both eyes to be normal, although the vessels of the discs are rather small and narrowed. Hearing normal.

Operative interference was deemed inexpedient; and hence the constant wearing of a small leathern pad over the tumor, to afford protection and produce even and continued pressure; the avoidance of all labor and excessive exertion; and the leading of an abstemious and regular life, was the treatment advised.

These notes furnish an accurate and excellent clinical picture, and, from a symptomatological stand-point, may be regarded as typically descriptive of this singular pathological condition.

I. LITERATURE.

As far as I have been enabled to extend my researches into the history of this interesting lesion, it appears of comparatively infrequent occurrence in surgical literature, and especially does this observation apply to surgical treatises of recent date; since, among the many late works on surgery, both special and systematic, with the vast number of journal publications, which I have examined, this affection seems to have escaped the notice of all except Dr. Gross, who is the only author referring to these formations; and even this reference made by him is exceedingly brief, and does not embody any of his personal observations. He classes the affection under the head of *venous tumors* of the cranial bones.¹

I have succeeded, nevertheless, in finding some scant mention of these tumors by a few writers, chiefly French, prior to twenty years ago, and which, among other less distinctive terms, are described under the several designations of: *Vari-cose veins or venous varicosities of the skull* (Chassaignac); *Sanguineous herniae of the vault of the skull by communication, through openings in the bone, of the meningeal vessels with the exterior integument* (Dufour); *Reducible sanguineous tumors of the vault of the cranium* (Azam); and, *A new form of tumor of the vault of the cranium, produced by the blood in communication with the intra-craniad venous circulation* (Dupont).²

The last of these appellations I have adopted, with some modification, as the most fitting title for this monograph.

¹ *A System of Surgery*; by Samuel D. Gross, M. D., etc. 6th ed., vol. ii, p. 28, Phila., 1882.

² *Essai sur un nouveau genre de tumeurs de la voûte du crâne formée par du sang en communication avec la circulation veineuse intra-crânienne*,—par Emile—Pierre—Louis Dupont. 74 pp., 4to, Paris, 1858.

NOTE.—The above is a thesis, presented, for the Doctorate of Medicine, to the Faculty of Medicine, Paris, April 20, 1858, and is decidedly the most elaborate paper on the subject with which I am acquainted, and to it I must acknowledge my indebtedness for much of the material contained in this essay. In this connection, also, I desire to express my obligations to Surgeon John S. Billings for courtesies extended to me in the examination of works from the National Medical Library, at Washington.

Furthermore, there are cases reported by Busch, Nélaton and Richard, Hutin, Percival Pott, Azam, Middeldorff, Flint, Baron H. Larrey, Bérard (senior), and Verneuil.

These cases, not only on account of the total absence of all mention, and, I may say of, apparently absolute ignorance, of such formations by modern surgeons, but also, the interest which they present individually and collectively, are deemed of sufficient importance to bear a detailed repetition; and hence I shall not hesitate to incorporate a sketch of each one of them in this section of my subject. I shall endeavor, however, to abridge and condense these histories as much as is consistent with their proper and connected presentation, and a correct elucidation of the different salient and important points which they offer. But several of them are of more than passing interest by reason of the careful and elaborate post-mortem examinations accompanying them, and these, of course, will receive a more extended transcribing.

An attentive consideration of all the cases coming under my observation discloses such a difference in their etiology, that they are naturally and conveniently separated into the following groups, viz.—*Class I.* Cases of undoubted congenital origin; *Class II.* Cases arising spontaneously, or, at least, without presenting any manifest or tangible cause; and *Class III.*, in which the cases are due to direct traumatism.

CLASS I. CASES OF UNDOUBTED CONGENITAL ORIGIN.

(1) *Case of Busch.*¹ During the accouchement of a patient, after the discharge of the waters (which were thick, greenish, and fetid), and whilst head was still at superior strait, a large, fluctuating tumor was distinguished on child's head. The child was still-born; male; weight 7 lbs.; skin detached and macerated, and limbs flaccid, showing conclusively that death had taken place some time prior to labor.

On the head there was a rather large, fluctuating tumor, of a bluish color, which, in length, extends from the external occipital protuberance to the middle of the sagittal suture, and, in the other direction, from the point of ossification of one parietal bone to the corresponding point on the opposite side, and projects the most in the region of the small fontanelle. All the cranial bones were very mobile, and that which deserves especial note, from an etiological point of view, was the absence

¹ *Heidelberger klinische Annalen*, t. ii., p. 249, 1826: also Pigné, *Mémoire sur les Céphalomatomes, dans Journal hebdom.*, Sept., 1833, t. xii., p. 480; and *Thèse de M. Chassaignac, Sur les tumeurs de la Voûte du Crâne*, p. 125, 1848. Burchard, *Rech. sur le Céphalem. (Journal l'Expérience)*, 1838, p. 292). Dupont, op. cit., p. 15.

of a defined and prominent hard ring around the border of the tumor.¹ The tumor was opened by a large transverse incision, extending from right to left, which discharged a quantity of dark-colored, viscous blood, and of an offensive odor. About two ounces was collected. This fluid was situated between the bones of the skull and the pericranium, and a careful examination of the line of incision showed that several vessels extending across the superior longitudinal sinus had been divided, and that the sinus was in communication with the tumor.

The cranial aponeurosis over the site of the small fontanelle was thick and soft,—being infiltrated with a gelatinous lymph,—this thickness becoming less as the borders of the tumor were approached. This thickness, also, was easily distinguishable from an ordinary tumor of the head. There was no extravasation either on the brain or dura mater, although the cerebral vessels were engorged with blood.

It should be remarked that in Pigné's account of this case of Busch's the lesion is regarded of traumatic origin, being due to the traction and pressure of the forceps employed in the delivery. But this, evidently, is erroneous, for the history given by Busch is so clear and explicit on this point that the intra-uterine death of the child, several days prior to time of labor, is not to be questioned; and hence I must consider the case, with Dupont, as one of congenital formation.

(2) *Case of Flint.*² He found in the occipital region of an infant, several days old, a tumor of considerable size. He opened it. It contained venous blood, which flowed out in such quantities that the infant speedily perished from hemorrhage. Examination showed this tumor to communicate with the longitudinal sinus.

(3) *Case of Verneuil.*³ In 1854, a young girl, aged 17 years, of a strong constitution and good health, presented herself to me for advice concerning a tumor on the forehead which had existed from infancy. She had some indefinite recollection of a blow received in early life, but it was entirely too vague to be relied on. No evidence of hereditary trouble in any of the family, and the tumor is, evidently, of congenital origin. The symptoms are as follows: Fluctuating, soft, and round; painless; ordinarily it is of the volume of a large nut when she leans forward; and is situated on the right frontal protuberance. The skin is unaltered in consistency or color, and no vascularity of the surrounding parts. Pressure causes it to sink and disappear entirely, and after reduction one can definitely determine that there is no appreciable alteration of the bone, and only a little circular ridge around it (its limiting boundaries) is perceptible. This is rather resistant. The tumor is easily reduced by pressure, which must be steadily applied, and by this manipulation the sensation of a pouch partially filled with fluid, which empties itself, is experienced. The tumor bulges out under the influence of exertion and emotions, but there is neither bruit nor pulsation; and, again, cough does not affect it. When the head is lowered the tumor becomes voluminous, with the dimensions of 3 cm. in diameter

¹ Note—This reference (as remarked by Dupont) is to the very noticeable osseous ring which is so constantly found in the blood-tumors of the new-born.

² Pigné and Chassaignac, loc. cit. Dupont, op. citat., p. 16.

³ *Bulletins de la Société de Chirurgie*, t. iv., p. 414, et suiv., quoted by Dupont, p. 22.

by 1 cm. deep. In the dorsal decubitus the tumor attains a very large size, but it is largest when she sits in the sewing position with the head inclining forward. During the menstrual epochs, however, the tumor assumes, perhaps, its greatest volume, and at these periods she suffers from decided headache, but to this she is, at any rate, subject.

Later a cure took place, or, at least, the tumor subsided after a very prolonged examination with repeated palpations to which she was subjected at the Surgical Society.

M. Verneuil announces the favorable termination of this case with caution and reserve, because of his inability to verify the permanence of the cure by another examination at a more remote date; as, immediately after the subsidence of the swelling, she disappeared, and was not again seen.

(4) *Case of Middeldorpff.*¹ Matilda H—, æt. 9 years; daughter of a peasant living at Carlowitz, near Breslau; well nourished and developed. From birth there existed in her forehead, a little to the left of the median line, a tumor covered by the hairy scalp. It is round, smooth, and does not pulsate. Shortly after birth it was the size of a cherry, but now (1851) it presents a diameter of an inch and a half, and one-quarter inch thick. Offers different degrees of tension—one time it is flaccid and then again much distended, but there is always a little fluctuation.

Bending the head over towards the ground, excitement, etc., causes it to swell up; deep inspirations make it sink slightly; it quickly and without difficulty disappears under continued pressure, and this does not produce the least symptom of cerebral compression. After reduction the base of the tumor is found to be circumscribed by an edge or ridge three-quarters of a line deep, denticulated, and which is felt to be bony by the exploring needle. The base or floor of the tumor is formed by the cranial vault, almost flat, and without the sensation of any opening penetrating it, and is covered seemingly by a thin membrane. There are no cords or filaments to be felt in the tumor cavity except near the skin and hair line where an ovoid cartilaginous button is perceptible, which is movable and about the size of a grain of rice. In 1856, at my clinic, I examined this tumor a second time, but, with the exception of being a little larger, it presented the same symptoms; the girl, also, continuing in good health. Pressure upon the tumor, after encircling it with an ivory ring, which closely fitted its base, and pressing the ring down sufficiently to cut off the skin circulation, also causes it to disappear, thus demonstrating conclusively that the blood flows from the direction of the osseous base, and not from circumference vessels.

M. Chassaignac² mentions having heard Professor P. Bérard (senior) relate, during a course of lectures on Anatomy, delivered in 1831 or 1832, the history of an infant in whom there was a varicose dilatation communicating with the superior longitudinal sinus, and which swelled considerably when the child cried or made any exertion.

¹ Middeldorpff reports this case in a private letter to Dupont (vide op. cit., p. 26).

² Loc. cit.

This is a simple statement without any careful or decided clinical details, and nothing to indicate its manner or degree of communication with the intra-cranial circulation; and hence there is an element of uncertainty and obscurity associated with it.

Dupont, however, in his reference¹ to the case, accepts and classes it among this order of tumors.

There seems to be no reasonable doubt about its being of congenital formation.

CLASS II. CASES ARISING SPONTANEOUSLY, OR, AT LEAST, WITHOUT PRESENTING ANY MANIFEST OR TANGIBLE CAUSE.

(1) *Case of Baron H. Larrey.*² Val-de-Grâce, Ward 29, No. 10. O— (Antoine), musketeer of the 8th Line; æt. 23. Entered, in September, 1856, with a varicose frontal tumor, the base of which, almost circular, was the size of a five-franc piece, situated on the forehead above the left eye, partly within and partly below the hair. He had no recollection of ever having sustained any blow or injury of any kind about the head, and he had not perceived its presence until one day, at the age of 11 years, his mother asked him the cause of the swelling on his forehead. Before the army examining board he was superficially examined, accused of possessing voluntary control over the swelling, and declared fit for service, but trial showed that it was impossible for him to wear the shako.

At present the tumor is found slightly elevated above the skin-level when the patient is reclining or even standing, but it promptly increases in size when the head is lowered. There are a few ill-defined, deep blue spots on its surface; it is soft to the touch, but gives no sensation of pulsation. When sufficiently depressed to feel the bone beneath, there is discovered an irregular or stellated perforation of the cranium, and only the shape of which prevents the easy introduction of the finger therein. Compression causes no pain in the tumor itself, but does produce a little pain with a sensation of mistiness of vision in the eye of the affected side. Slight symptoms of cerebral compression are also produced by pressure upon the tumor. The day of his admission to the hospital, after a rather prolonged examination, he was seized with marked vertigo accompanied by vomiting, diarrhoea, etc. He was declared unfit for military service, and consequently discharged.

At a meeting of the Société de Chirurgie, Paris, October 1, 1856, Middeldorff referred very briefly to the case of a young girl in whom such a tumor was situated high up in the median line of the occiput, and emptied into the superior longitudinal sinus. This patient was also mentioned by him in a personal letter to M. Dupont (Op. cit., p. 26), in which he stated that, unfortunately, the clinical notes of the case had been mislaid, and hence he was unable to give, with any degree of certainty, from memory alone more than an outline of the case, with the correct diagnosis.

¹ Op. cit., p. 16.

² Gazette des hôpitaux; 14 Octobre, 1856.

(2) *Case of Nélaton and Richard.*¹ B—, laundress; æt. 19; female; moderate stature and strength; chestnut hair; born at Signier (Mauche); admitted September 22, 1856, to *l'hôpital des cliniques*, bed 4 of women's pavilion, during the time that M. Richard had charge of the service of M. Nélaton, in the absence of the latter.

She gave the following history: No hereditary trouble in herself or any of her family. Never had but one serious attack of illness, and that when 4 to 5 years of age, and which was, evidently, some "sweating fever." In 1848, when 11 years old, she was seized with a violent, throbbing frontal headache, which lasted the entire night, and depriving her of sleep. The day following the pain still present, and greatly augmented when she assumed the recumbent posture. In arranging her hair on this day she lowered her head, and in doing so discovered that there was a soft point on the top of her head as large as a five-franc piece. In reply to questions her mother informed her that it had existed ever since her sickness at the age of from 4 to 5 years, at which time she first discovered it. Thus it is probably of congenital origin. She is subject to headaches which appear two or three times a month and last about a day, but uninfluenced by the menstrual epoch. Tumor has been increasing since 1853.

Examination now presents the following characters: It is situated at the summit of the occipital region over the sagittal suture—at superior angle of the occipital. When head is erect, as in standing or sitting, tumor not visible, and no projection evident to the touch, but when head is carried forward or backward the tumor appears immediately, and is found to be globular and voluminous, with a base of $6\frac{1}{2}$ to 7 cm. in diameter. Any exertion causes the tumor to rise and become apparent, but it again subsides when the effort ceases. Uninfluenced by cough or respiration. When prominent it is soft, fluctuating, without pulsation or bruit. Natural or artificial reduction not followed by any cephalic symptom. Reduction very easy, and presents the sensation of a pouch full of liquid which empties itself steadily and rapidly. Compression of the internal jugular veins, even when head is erect, causes the tumor to rapidly fill and rise up. Again, the head being erect, a string tied circularly around the head, and the internal jugulars compressed, the tumor appears quickly and to its full size. Border of tumor smooth and nearly regular. Carefully practiced palpation shows two or three depressions which might permit communication through the cranial bone, but the curvature of the skull is unaltered. Coverings normal, without oedema or infiltration.

The inconveniences of which patient complains are the following: Vertigo, which is produced by stooping or any sudden or extended movements of the head. After each examination drowsiness followed. Only treatment to be adopted was that which would control the increase of the growth. October 3d, patient left the hospital. November 18th, readmitted. Now complains of tension and stiffness about the head, with vertigo upon each and every movement. No explanation of this in the tumor itself, but, as she is probably *enceinte*, these phenomena probably due to nervousness of pregnancy. Patient now lost sight of until December 10, 1857. The supposition of pregnancy had proven correct; and after accouchement she had an attack of facial erysipelas, accompanied by intense fever and delirium. Local state of tumor and adjacent parts modified. She had taken no precautions to arrest progress of tumor. Vertigo and other head symptoms had continued during first two

¹ This case was presented by M. Richard to the Société de Chirurgie, October 1, 1856; and was afterwards examined, and fully and carefully reported by M. Dupont (vide p. 28).

months of pregnancy, and then all symptoms of malaise, etc., had entirely disappeared.

The following changes in the tumor are noted: Increased in all diameters as shown by careful measurements. The surface of the bone had no longer its normal curvature, but presented the appearance as if a chip or splinter of bone had been raised up from the cranial vault, especially at the anterior border; and this portion (anterior), also, appeared larger, as if a collection of osseous particles had taken place at this point. The rest of the border indicated no change.

In this general osseous depression the finger easily and manifestly demonstrates four smaller depressions in the bone, two of which are situated in the median line, and one on each side of that line. The median depressions are thus disposed: The first median depression is circular and placed immediately behind the anterior border of the tumor; it has a diameter of $1\frac{1}{4}$ cm., and admits only the tip of the pulp of the finger. The second median depression is located $1\frac{1}{2}$ cm. behind the first one, and has a diameter of $\frac{3}{4}$ of a cm. only. The left lateral depression is directed from before backward and from left to right; it has the form of a cleft of less than $\frac{1}{2}$ cm. in width by 1 cm. long; its posterior extremity extends to within 1 cm. of the median line, and to 1 cm. behind the first depression. The right lateral depression is on the same level with the left one, but it is circular and is less than $\frac{1}{2}$ cm. in diameter. The anterior median depression has thus modified the external appearance of the tumor, which is now not regularly globular, but resembles the hilus of a kidney. Placing a constricting band around the head with graduated compresses in the temporal fossa, the head being erect, and then causing the patient to bend forward, the tumor swelled up as usual, but there were no dilated veins along its circumference, thus excluding a skin origin; and again closing the four osseous passages by the finger tips, and then inclining the head forward, the tumor expanded with some rapidity, showing that there were other unrecognized communicating orifices in the bone.

January 24, 1858. Tumor now increased in size on its left side, and an examination shows that at this locality a smaller tumor ($1\frac{1}{2}$ cm. in diameter) had formed in connection with it. This, it was easy to distinguish, communicated with the large tumor.

This case of MM. Nélaton and Richard is considered by them of *probably* congenital formation (p. 36), since the tumor was discovered at an early age, and the history presented no evidence of direct traumatism. When it is remembered, however, that the mother of the girl affirms that the growth was not present until after the attack of sickness experienced when her daughter was about 4 or 5 years old,—and had it existed prior to this event it is more than probable the very locality would have revealed its presence; that the patient suffered from a long period of serious illness, and immediately thereafter “a soft spot” in the head was discovered; and, again, that the history is devoid of any direct traumatism whatever, is regarded as quite sufficient to doubt, at least, the congenital origin of the growth, and to warrant the place which I have given it in this group of so-called spontaneous cases.

To this division also belongs the case of Dr. C. H. Mastin, which is described in the first pages of this article.

CLASS III. CASES RESULTING FROM DIRECT TRAUMATISMS.

(1) *Case of Azam.*¹ C——, age 22; miller; robust; entered the Hôpital Saint-André, service of M. Hirigoyen, November 11, 1850. Situated on the top of the frontal region, a little to the right of the median line, was a tumor of the dimensions of a large nut. This was irregularly round, manifest fluctuation, but no discoloration of the skin. Gentle pressure with the palm of the hand reduces it completely in two or three minutes, after which the skin remains empty and flaccid, and is, also, very thin and soft. Hence one can easily recognize an irregularly circular depression across it with salient and unequal edges. The patient reduces it easily himself, and it disappears when the head is thrown backwards and reappears with the forward inclination. The forward posture can not be maintained for any length of time on account of vertigo which accompanies this position. No bruit or pulsation, but seems a little more tense during the respiratory movements. I have thought that I perceived an obscure blowing sound in the tract of the superior longitudinal sinus when the tumor was rapidly reduced by the patient, but my confrères could not verify it. No pain in or about the tumor, and were it not for the deformity, with the vertigo whilst bending forward, he would not be inconvenienced in the slightest by its presence. As to its origin he reported that, at 15 years old he was kicked by a horse in the frontal region. Did not lose consciousness, and even continued to follow his occupation,—it being only several days thereafter that he discovered this tumor, which has always presented its present appearance. He had consulted another physician some time previously, who made an exploratory puncture, which was followed by a jet of blood. This, however, was easily arrested.

Nov. 20th. M. Hirigoyen punctured it with a lancet. As on the first occasion blood spouted out, having all the characters of venous blood. A probe introduced through the opening discovered a depression in the bone and some roughnesses, although the bone is not denuded but covered by a thin, soft membrane. No orifice of communication with the interior of the skull is discoverable, but this communication must exist, as the large quantity of hemorrhage could have originated only from some considerable source—probably the superior longitudinal sinus. Hemorrhage was easily controlled, and skin wound healed rapidly under simple protection by a bandage. Pressure over the tumor was employed for twenty days without result, and patient left the hospital in an unchanged condition.

C—— was presented to the Society of Medicine November 27, 1854, by our colleague Dr. Dupuy; and I saw him yet again three years afterwards, still finding the tumor unchanged.

The avoidance of any operation and the use of local pressure was advised.

(2) *Case of Azam.*² Jeanne T——, of the Bourg-sur-Gironde, age 60 years, consulted the "charity committee" of the Medical Society of Bordeaux in March, 1854, about a tumor situated in the frontal region. She stated that about eighteen months previously, whilst at work in the field, she stepped upon a rake, which flying up, the end of the handle struck her with considerable force on the forehead. The

¹ Dupont, op. cit., p. 20; also *Gazette Médicale*, p. 411, 1854; *L'Union Médicale*, 1858, p. 49; and *Gazette des hôpitaux*, 14 Janvier, 1858.

² Loc. cit.

pain was intense, but she did not lose consciousness. The apparent contusion was relieved by ordinary measures without the attention of a physician. Twenty to twenty-five days afterwards she recognized the existence of a tumor at the point of contusion. This was soft, of the size of a small nut, and hardened and increased in volume when she lowered her head. No headache. Light pressure caused the disappearance of the swelling. Experiencing no pain, she did not consult a physician until after three months had elapsed, at which time the skin covering the tumor becoming thinned and of a violet color, she consulted M. Gaignerat, of Bourg, who punctured it; and, according to her statement, it bled most profusely. However, a bit of English taffeta sufficed to staunch it. She presented herself now at the Medical Society. At this time the tumor, situated on the median (frontal) line, near the root of the hair, was about the size of the half of an ordinary nut; soft and fluctuating; slightly violaceous in color; without either pulsation or bruit; and conveying to the fingers the sensation of a pouch (the skin) containing a spongy substance. It becomes tense when the head is bowed down or lowered, and a continuance of this position causes dizziness. It softens and slowly diminishes under pressure by the hand or fingers. It is very evident that the fluid passes into the skull. After reduction of the tumor there remains under the skin a soft tissue which prevents any close examination of the underlying bone. Taking her to my office for a closer and more careful examination, and making her bend her head forward so as to render the tumor tense, I punctured it with a small trocar. Only a small quantity of venous blood escaped. Manipulating the canula in different directions, I recognized that the tumor was formed not of a single pouch, but of a spongy tissue composed of large cells. This explained the slowness with which the fluid trickled out, and which, also, evidently passed through a narrow passage in the bone into the skull cavity. I could not discover this opening, nor did I recognize any rugosities or denudation of the bone.

(3) *Case of Percivall Pott.*¹ A boy, eight years of age, son of a Jew merchant, of this city, received a blow on his head with a stick. This made him giddy for a few minutes, but there was no bleeding, no external wound, and but little pain, and he concealed the fact of there being a swelling over that portion of his head until it was discovered by his barber. In the middle of the top of his head was a tumor, about the size of a walnut; was indolent, had a dull kind of pulsation, and palpably contained fluid. In the presence of Serjeant Amyand and Mr. Shipton the tumor was divided with a knife, and a quantity of blood discharged; but when the swelling was emptied it was found that the blood continued to flow, plainly not from the scalp wound, but from the bottom of the cavity. Examination now showed that the sagittal suture was fractured, and that a portion of the displaced fragment of bone was forced into the sinus, and by the sides of which the blood issued forth. Attempts to extract this fragment failed. By the advice of the consultants, a small perforation was made on one side of the suture, but through this the point of the elevator could not be introduced so as to remove the broken piece, and so the trephine was applied on the other side of the suture, but with a like result. At last it was decided to risk the hazard of wounding the sinus (which was, indeed, already wounded by the broken bone), and enclose the suture within the circle of the trephine. This was done, but the button of bone came away in pieces, and left the original perforating fragment still piercing the sinus. This fragment being with-

¹ *Chirurgical Works*, first Amer. from last London ed., vol. i., p. 132; Phila., 1819: also French edition, t. i., p. 151; Obs. 27, 1760: also Dupont, op. cit., p. 14.

drawn by means of forceps, a flux of blood followed, but a dossil of dry lint controlled it. The patient recovered.¹

(4) *Case of Hutin (occurring in the service of M. Hutin, at l'Hôpital des Invalides.) Reported by Dr. Gustave Dufour.*²

Achille — Maximilien, Marquis de W——, Comte d'I——, born 1770, at Paris; entered infantry service in 1792. In 1799, in charging a redoubt in the Piedmont, he received a blow from the butt end of a musket, in the hands of an Austrian, on right side of forehead about 3 cm. from median line. Stunned by the stroke, he was carried from the battle field, and remained unconscious for twenty-four hours. When he regained his senses perfectly, he was informed by the surgeon in attendance that there was a fracture of the skull, and the lesion was very grave. There was no wound of the integument, but a deep depression under the skin was quite perceptible to the touch. During almost the entire period of the next year he was an inmate of different hospitals, and received divers forms of treatment, especially pressure to the seat of injury. The ultimate result of the wound was an infirmity which incapacitated him from following the profession of arms. When he leaned forward with the head inclined towards the ground, he would feel a swelling form on the site of the wound, having the volume of a nut, of a violet color, and which would disappear spontaneously when he again assumed the upright position. In 1814 he gained admission to the Hôpital des Invalides, and in 1847 M. Hutin, then becoming surgeon in chief, was peculiarly interested in his case; and ordering his history carefully recorded, he himself made the following notes: "Cicatrix not apparent; osseous depression very marked. The condition is, doubtless, the result of absorption of the diploë and the approximation of the two tables of the frontal bone. The pouch is small, formed at the expense of the skin, and is not apparent when the soldier is standing, sitting, or reclining on his back; but when he bends forward with the head lowered, the pouch makes its appearance and attains the volume of half an egg. It is livid in color; is formed, evidently, as are cysts in contused parts; and is dependent on a communication with the superior longitudinal or some other sinus."

1 Note.—Very similar to this case of Pott are the following:

A dragoon, receiving a wound of the trunk, fell from his horse, striking the summit of his head. He soon became comatose, and, when examined, a swelling of the scalp was discovered at the vertex, the point of injury. This being incised, a separation of the edges of the sagittal suture was discovered, and from which blood was seen to flow. Two buttons of bone were removed by the trephine on the-twelfth day, to permit the ready exit of blood effused from a tear in the wall of the superior longitudinal sinus. The symptoms now rapidly subsided, and recovery followed. (*Vide Guthrie, Commentaries on Surgery, etc., p. 349, Amer. ed.: Internat. Encyclopedia of Surgery, Ashhurst, art. "Injuries of blood-vessels," vol. iii., p. 208, 1883.*)

A parallel case is one mentioned by M. Mouton (*Memoirs of the Royal Acad. Surgery of France, Sydenham Soc. Transactions, p. 8; also Internat. Encyclopedia of Surgery, Ashurst, art. "Injuries of blood-vessels," vol. iii., p. 208, 1883*), where trephining was practiced on a man, eleven days after a fall, in whom death was imminent from blood-extravasation coming from the superior longitudinal sinus, wounded by a separation of the edges of the sagittal suture. This operation furnished free vent, resulting in immediate cessation of the threatening symptoms.

Had it not been for symptoms of compression demanding speedy operative interference, these cases would have resulted, undoubtedly, in the variety of venous tumor which is the subject of this paper.

² G. Dufour, *Comptes rendus et Mémoires de la Société de biologie*, t. iii., p. 155; 1851; Du-
four, Op. cit., p. 10.

I learned that this old man, notwithstanding his age of 81 years, was in perfect mental and physical health, with the full possession of all his senses and faculties, and of a lively disposition. He did not wear the silver plate which had been given him to protect the injured region, and easily and readily reduced this singular variety of hernia with his own hand.

October 28th, 1851. Seized with erysipelas of neck and upper part of thorax, complicated with chronic bronchitis, and died November 3d.

Necropsy, November 5th, thirty-six hours after death. *Thorax*—Double pleural adhesions, but no organic pulmonary disease. Heart hypertrophied, but otherwise normal. Aorta infiltrated with cartilaginous patches, appreciably dilated, and filled by an enormous fibrinous clot, which also extends into the carotids. *Head*—No visible traces of the erysipelatous action. Normal in size and contour. On the forehead, 2 cm. below hair margin, and to right of median line, is seen a cutaneous space about 2 cm. in diameter, which is rendered distinct from surrounding skin by its rosy color; and this corresponds to a clearly outlined osseous depression beneath. Lowering the head of the cadaver fails to produce the phenomenon which was so easily brought about during life in that part of the skull. *Brain*—Sound and without traces of old or recent apoplectic spots; white and gray substances distinct; the vascular network of the pia mater is moderately injected, but without infiltration, and is easily separated and detached from the cerebral convolutions—even directly under the external wound. The visceral layer of the arachnoid, however, on the right side, 3 cm. from the middle line, is glued down to its parietal layer and also adherent to the dura mater, and any traction exerted upon these adhesions causes a few drops of blood to ooze out into its (arachnoid) cavity. The dura mater is, also, easily separated from the entire surface of the bone except at this locality of 3 cm. from the median line, where it is adherent to the osseous wall. Opposite to this attachment, the bone is perforated by several small openings. Injection of water and insufflation of air into the superior longitudinal sinus demonstrates the existence of a pathological communication (through the bone) of the sinus with the blood pouch above. The caliber of the superior longitudinal sinus somewhat increased, and filled by a long, reddish, fibrinous clot. Skin over tumor thinned, and sends out from its inner fibro-muscular surface attenuated fibrinous prolongations (trabecules, filaments, etc.) which attach themselves circularly to the periosteum on the circumference of the bone depression; and which depression is lined by a bit of cellular periosteum, and is 5 cm. in breadth by 2½ cm. in height. The circumference of the depression is formed by a notable thickness of compact bone tissue, but its center is very thin and spongy. The floor of the depression is also divided, by a jutting out of compact structure, into two smaller depressions: the left one extends a little beyond the middle line of the forehead, is rugose, and is sprinkled with little dark openings; the other on the right side is more extensive, and is riddled with minute apertures—entirely deprived of its vascular element (*diploë*), and corresponds to the thinnest portion of the cutaneous cavity, at which point both the skin and bone are translucent, so to speak. The frontal suture plainly seen above and below the osseous lesion, but especially apparent on the altered surface. Finally, the tegumentary covering was thinned, being deprived of all muscular and adipose tissue, and composed only of skin re-enforced by a delicate lining of fibrous tissue.

(5) *Case of Hutin.*¹ K——, born in 1771; entered military service in 1790; received, October 14, 1806, at the battle of Jéna, two saber wounds on the head,—

¹ *Mémoires de Médecine Militaire*, t. xiv., p. 232, 2e série; 1854. Dupont, p. 17.

the first on superior and middle of forehead, the second on the top of the head. Did not lose consciousness; fragments of bone extracted; recovery after about 9 or 10 months, without any grave symptoms. Forty years passed without his being troubled by any serious sickness, only he suffered from severe headaches. In March, 1846, whilst intoxicated, he fell into a bed of rocks, fracturing thigh and ribs. A pleuro-pneumonia was not tardy in developing; and in ten days thereafter he was also attacked with erysipelas, which was epidemic in the wards. Delirium; parotid abscess.

March 24th. Carries hand frequently towards summit of head to the right side of the most prominent cicatrix. Pressure here discloses circumscribed fluctuation and pain, which did not exist previously. Believing the existence of an abscess, a small incision was made into it, but only blood escaped. There was a blood pouch containing a black, semi-coagulable liquid, poured out between the osseous vault and the pericranium, thus detaching the latter. Attempts to detect a fissure failed. The day following the dressings were soaked with about 150 grammes of blood. Attempts to find a fissure still futile. Extended the incision, which brought to view a slow, continuous oozing of venous blood from the depths of the bony wall, and to the inner side of the wound. This was without pulsation, and uninfluenced by the respiration. A delicate blunt probe pressed upon this point readily passed on into the skull through a small opening which was covered over to about three-quarters of its extent by the soft tissues. Dry charpie and a bandage arrested the hemorrhage. Dressing removed third day. Pleuro-pneumonia proved fatal April 7th.

Autopsy. Head—Scalp puffed up and much injected from erysipelatous inflammation. Cicatrix on frontal bone adherent to the remains of the frontal suture, with marked depression of integuments in this locality. At 2 cm. beyond the fronto-parietal suture and within 1½ cm. of the sagittal, commences the other adhesions belonging to the anterior region of the *seventh* cicatrix, and which are equally resisting but of limited extent. None of these adhesions were touched by the knife until after the skull was opened. Below these is the pouch which was incised during life. This pouch (subpericranial) is about 4 cm. in extent from before backwards and 2 cm. from right to left. The skull cap being sawn through, the membranes divided, and the brain raised, all was normal except a trivial injection of the arachnoid, one or two points in the brain, and a small quantity of serum in the ventricles. Dura easily detached over almost the entire vault, except at point corresponding to wound of vertex, and on each side of the closed sagittal suture, where it adhered closely to parieties, but without any visible scar. At a point corresponding to the external angle of wound dura mater intimately united with external tissues through a fissure of right parietal bone. The unclosed opening of the bone was about 2 mm. in width by 1 cm. long. On opening the superior longitudinal sinus it was seen to contain a small quantity of coagulated blood, which was partially dislodged by a stream of water,—after which was visible a very pronounced projection in the sinus, passing in a line from behind forward and from right to left; and corresponding exactly to the external cicatrix. This projection proceeded from the depression of a thick splinter of bone depending from the internal osseous table, and was produced evidently by the saber blow,—being partially detached and thus remaining fixed for many years. This spicula terminated in a spine which had perforated the longitudinal sinus, and passing through into its lumen maintained patulous an opening into its wall of 4 mm. Through this opening a small quantity of blood had escaped from the sinus, and which, poured out between the bone and the dura, formed in this locality an oblong pouch of 3x2 cm. in diameter; but on the outside of the skull it had diffused itself between the bone (right parietal) and the periosteum, forming the

collection which had been mistaken and opened for an abscess. This external effusion had passed through an opening existing in the left parietal, $1\frac{1}{2}$ cm. in front of and to the right of the sharp end of the fragment, and resulting from the non-occlusion of that part of the bone divided by the saber blow. The extravasated blood between the dura mater and the skull was coagulated, and sent out a fibrinous clot into the open wound in the wall of the sinus. Another clot completely filled the osseous wound. Hence there was a direct communication between the superior longitudinal sinus and the wound in the integuments, for in this fracture there were no adhesions between the meninges and the pericranium as existed through the anterior fracture. By raising up the superior longitudinal sinus the perforated portion was displaced, and is thus seen to be a little to the right of the median line.

II. ETIOLOGY.

In the etiological study of these venous formations are encountered marked difficulties and drawbacks; for, indeed, such obscurity surrounds this portion of the subject that, excluding those cases resulting from *direct* traumatism, any examination can be conducted alone upon an absolutely theoretical basis.

I. In the grouping which, for apparent etiological reasons, I have found expedient to adopt, *Class I, or Cases of congenital origin*, comprises five examples (including the brief and unsatisfactory one of Bérard), and in two only (Busch's and Flint's) are there the slightest data to indicate, even approximately, the manner of inter-communication existing between the growth and the sinus.

Therefore, with this exceedingly limited knowledge of their anatomical characters, nothing can be stated with positiveness as to the cause or method of their formation, and the following theories, some of which have been advanced already, are only now proposed as being in the line of probabilities.

(a) Of these hypotheses the most specious seems to be that of the absorptive action of the *glandulae Pacchioni* upon the walls of the sinus and the cranial parietes. Dr. Gross (with others) asserts that, "the most common cause of the abnormal communication is spontaneous, progressive absorption of the osseous tissue corresponding with the Pacchionian depressions, when, under the influence of slight traumatism, the blood escapes beneath the pericranium."¹ * * * *

¹ Continued from p. 340.

² Loc. cit.

This assumption is strengthened when we consider the numbers of these granulations or glands within the cavity of the longitudinal sinus and upon the dura mater in its vicinity (notwithstanding that their microscopical presence in infancy is denied by many physiologists), and the activity of all cell proliferation, especially in glandular structures, and under morbid influences, in early life. But in congenital cases it seems to be essential that the absorptive action which these bodies are supposed to produce be carried on to complete perforation, without the requisite agency of slight external traumatism, to effect the escape of blood from the sinus.

In further support of these views I may refer to those obscure alterations and perforations occasionally met with in the petrous portion of the temporal bone, sometimes opening the tympanic cavity, which, according to Luschka, like the *fovea glandulares* of the calvarium, are not improbably the result of pressure exerted by these villous-like vegetations.

(b) Secondly, the aneurismal dilatation of a vein passing from the longitudinal sinus through the bone—many of which veins pierce the skull on each side of the tract of, and communicate with, this canal,—suggests itself in this relation, and to which the case of Flint might be regarded as having some slight resemblance. But opposed to this, and, indeed, to any form of venous varix, is the extreme, if not absolute, rarity of such a venous aneurism in this region, not to mention the absence of all aneurismal symptoms of a decided character.

This method of communication, however, is maintained by Dupont to exist in some instances.

(c) Certain constitutional or hereditary diseases should not be overlooked as very possible etiological factors.

Hereditary syphilis or the rickety diathesis occasionally finds expression in the production of craniotabes, where areas or spots of softened and thinned osseous structure take place in the cranial walls, only requiring some slight internal or external pressure to convert them into veritable skull perforations. Although this condition is but seldom observed congenitally, occurring principally in syphilitic infants during the first year subsequent to birth, yet it is worthy of note that this sometimes does happen; that the inner cranial

aspect is usually the primary seat of attack; and that they are generally observed occupying the posterior parts of the parietal bones—about the position where the venous tumor under consideration is, perhaps, most frequent; and, too, in which neighborhood the Pacchionian bodies most abound.

Parallel with this observation the so-called gelatiniform degeneration of the outer table of the skull (Parrot) must be referred to, as offering points for consideration in this study. How far the mere absorptive power of the Pacchionian glands alone, or stimulated by or associated with a systemic vice as above mentioned, or any of these individually, may act, is a question needing for its answer careful and painstaking research.

(d) Finally, developmental arrests (of which the case of Busch is, at least, suggestive), including, also, absence of ossification in the triquetral or Wormian bones, and abnormal fontanelles, must not be ignored in following out this inquiry. Against the latter, however, in those instances where the growth is situated centrally and anteriorly on the head, may be urged their extreme infrequency in the median part of the cranial vault; and here it may be remarked that in the congenital cases the tumor occurred equally in the frontal and occipital regions.

II. An examination of the etiology of *Class II, or Spontaneous Cases*, is met by equal if not greater obstacles than those characterizing the investigation of the first class, since in the present instance there are only the symptoms of the disorder, and these largely subjective, which are available in furnishing any information whatever relative thereto,—again necessitating, of course, a resort to the uncertainty of speculation.

These probable causes comprehend, in the main, those applicable to the congenital group, and have received already a sufficiently detailed notice. Therefore, beyond a simple enumeration of them in the order of their greatest applicability or most probable tenability, further reference is deemed unnecessary.

Here again the most plausible theory, and the one deserving of first mention, is that of (a) the absorptive action of the

Pacchionian glands exerted upon the osseous tables; and, for obvious reasons, is decidedly more applicable to the cases of spontaneous origin than to the congenital form of the disease. In this division is readily understood how *slight* traumatism can occur, which is considered essential to complete the breaking through of those thinned points produced by the localized action of these glands; and here, also, can be found the association of a certain degree of age and growth which anatomy has demonstrated to be favorable, at least, to the development of these bodies,—conditions non-existent prior to birth.

(b) Coming next is the explanation proposed by M. Dufour.¹ He believed the abnormal communication was caused by an obscure form of osteitis, followed by interstitial resorption of bone, the probable consequence of a trivial contusion.² Such an inflammatory process, however, to my mind, presupposes the presence of some constitutional taint which renders the osseous tissue peculiarly susceptible to the taking on or lighting up of this process upon the reception of the contusing force.

(c) Aneurismal dilatation of a vein passing through the bone into the sinus. The same objections hold good here as in the congenital variety.

(d) Localized diseased processes in the structure of the sinus itself, as in phlebectasia, or in phlebitis, followed by osseous absorption. But the absence of abundant and marked fibrous elements in the formation of the tumor, or phlebectasiac walls, are arrayed in opposition to such action.

(e) Lastly, constitutional or systemic vices—more especially syphilitic or strumous—as manifested in those osseous changes already referred to. In this category should be included any systemic condition predisposing to bone alterations or degenerations in general. And just here it must be remembered that, in the case of MM. Nélaton and Richard (case 2) the growth was not discovered until after a severe illness of the patient at the age of about five years.

¹ Loc-Citat.

² Note.—This theory might be regarded, at first glance, as pertaining to the *traumatic* class, since *slight* traumatism in the form of a contusion is one of its essential elements. But whereas the traumatic group is composed of those cases only which are produced by severe and *direct* injury—in a word fracture of the skull,—it is seen that this really belongs to the division (spontaneous) to which I have assigned it.

III. The same obscurity and difficulty, however, does not obtain of the *traumatic cases*, *Class III.*, as of the two preceding groups, for in this are included only those instances where the lesion is *directly* traceable to some wound or blow applied immediately to the cranial vault. Traumatism, therefore, occupies here a position so clear and well-defined in the relation of cause, that it becomes at once apparent without any dubious or speculative inquiry.

There are several points, nevertheless, that should be brought into more prominent notice than the mere detail of the clinical histories have permitted, and to which, in this place, a brief reference, at least, is desirable.

These points are the positive pathological characters furnished by the elaborate post mortem examinations accompanying two of the cases, and by the operative surgical measures adopted in another, together with the nature of the injury and the instrument or method by which the wound or blow was inflicted.

Respecting the distinctive features of the injury I may assert that, in each and every instance it was a severe one—a fracturing force—resulting in fracture of that portion of the skull receiving it.

But among the five examples composing this class it is especially interesting to note that four were characterized by the absence of all integumentary wound—being purely *subcutaneous*—and in one only (Hutin's case) was the fracture open or compound.¹

In one of Azam's cases, a boy, the tumor resulted from a kick of a horse, and appeared a few days thereafter, showing that the sinus must have been extensively wounded—probably a sharp fragment of bone puncturing or lacerating it,—as the time intervening between the injury and the appearance of the pouch was too short for absorptive changes to have effected any material alteration of the opening; whilst in his other the blow was produced by a heavy rake handle, but the swelling

¹ Note.—Punctured and other compound fractures of the skull not infrequently result in wounding of the underlying sinus, and, in illustration of this, numerous instances of such an injury have been reported, notably among which are the cases of Gagniere, Lassus, Hennen, and others.

This class of injury, however, does not come within the limit of the present discussion.

did not manifest itself until after the lapse of about twenty-five days.

Here the tumor was tardy in visible development, and certain osseous alterations may have modified the orifice between the skull and the sinus as originally produced by the traumatism.

Neither of these afforded a necropsy.

The lesion in Pott's case was caused by a forcible lick with a stick, and which was followed by its immediate appearance. Being mistaken for an abscess by that distinguished surgeon, it was freely incised; but, when fracture was revealed, he trephined the skull over the sagittal suture, finding a splinter of displaced bone directly piercing the sinus.

One case of Hutin, was in the person of a soldier, who received a crushing blow dealt with the butt-end of a musket, producing skull fracture. A post mortem examination fifty-two years subsequently verified the presence of fracture, with an opening in the superior longitudinal sinus; but there existed, in addition, necessarily, certain osseous changes resulting from the length of time of the existence of this abnormal communication. In his second patient the lesion was caused by a sabre stroke, producing a compound comminuted fracture of the cranial vault, with removal of loose bone fragments.

Forty years afterwards death resulting from a pneumonia coming on after a fall, an autopsy disclosed a long fragment of bone perforating the wall of the sinus, and thus placing this canal in communication with the external blood-pouch.

Thus the information gained from these cases, and particularly that obtained from the autopsic examinations, is sufficient to render safe the assertion that, in all traumatic cases fracture is invariably present, and in which the wall of the sinus is directly wounded either by (1) a depressed fragment or fragments of bone, (2) lacerated by the separated edges of the fractured bone, especially if the line of fracture passes across the suture, to which the sinus is intimately attached, or (3) torn through by a disunion of the suture over the sinus,—particularly the sagittal suture.¹

¹ Note.—Instances of wounding of the sinuses of the dura mater by separation of

III. MORBID ANATOMY.

The classification of this lesion into the congenital, spontaneous, and traumatic forms, is as essential in the study of its pathological anatomy as in the etiological division of the subject; but, our knowledge of the anatomical characters being derived almost exclusively from one class, it follows, necessarily, that we can speak definitely of that one group alone, leaving the others to be dealt with conjecturally or from an *a priori* stand point.

As previously remarked, all the direct light thrown upon the pathology comes from examinations conducted in three traumatic cases, with scant and equivocal information supplied by two congenital instances, without a single gleam from the spontaneous group; and, therefore, all conclusions as to the morbid anatomy of this affection are based, almost solely, upon those cases which are due to trauma.

The points of especial interest in this study, and which comprise those of most importance, are, (1) the general character of the tumor; (2) the relationship of the tumor to adjacent parts, including the nature of the tissues limiting or bounding it; (3) the tumor contents; and (4) the connecting passage between the cavity of the tumor and the sinus within the cranium.

These I will examine separately, bearing in mind, at the same time, their association with each of the several groups individually.

1. *The general character of the tumor.* This tumor may be described briefly as an indolent swelling in the form of a pouch, external to the skull, composed of one or more cavities, containing venous blood, and in communication, through the bone, with the cerebral venous circulation.

In the *congenital class* the pouch was shown, by post mortem examination, to be single in two cases; and in the remaining two this same arrangement of its cavity was also pretty well

the edges of a suture, especially the superior longitudinal by disunion of the sagittal suture, have been recorded.

Among others I may refer to the cases of Guthrie and M. Mouton, which have been mentioned already. (Vide note, p. 14.)

assured by the sensation conveyed to the touch upon careful manipulation, both before and after its artificial reduction.

Palpation with other physical conditions indicated very probably the existence of the single pouch or cavity in all of the *spontaneous* cases; although in the patient of MM. Nélaton and Richard, the morbid action evinced a tendency to the production of multiple growths, for a second, distinct, tumor appeared near, and in communication with, the first or original one, after the expiration of several years. Both these primary and secondary formations, however, were evidently of the single cavity variety.

The only case of more than one or several cavities composing the pouch was in one of the *traumatic group*, where the tumor was arranged, apparently, into cells or partitioned cavities communicating with each other. This cellular character was demonstrated by both palpation and puncture with a trocar, combined with gentle exploration by means of a small blunt probe or stylet.

Manipulation demonstrated a single pouch in another of this class, whilst the remaining three were found upon operative and autopsic examination to consist, also, of but one sac. Therefore, I may say, the single cavity is the most frequent, if not characteristic of this venous tumor.

In every instance the tumor was external to the bone, except in one case (traumatic) where it was partly within and partly without the skull. And, again, all the examinations disclosed the presence of venous blood filling the tumor cavity, and which was in communication, either directly or indirectly, with the sinus. Upon these can be based substantially the opinion that such are the essential physical characters of the growth.

These characters will be the subject of separate and more extensive inquiry as we proceed in the consideration of the affection,

II. *The relationship of the tumor to adjacent parts, including the nature of the tissues limiting or bounding it.* Taking the coverings of the cranium in their order from without inwards, I find the anatomical location of this tumor may be (*a*) between the integument and the cranial aponeurosis; (*b*) between the fibro-muscular layer (aponeurosis) of the scalp and the peri-

cranium; (*c*) between the pericranium and the bone; (*d*) between the pericranium and the bone, and extending internally between the skull and the dura mater.

(*a*) Although not determined by actual dissection, the seat of the tumor between the skin and the epicranial aponeurosis is, at least, probable. Clinical observations alone, however, are inadequate to decide this exact seat, because the appearance and sensation of the pouch is not an index to the composition of its coverings, since both the skin and aponeurosis might be so extremely thinned or attenuated as to present to the touch the sensation of only integumentary thickness, and accompanied by a violet color as if the contained blood was immediately beneath the skin.

I am unable to point out any conditions which would render this position or relationship of the tumor more prevalent in one class than in another, unless it be in certain instances where all the tissues of the scalp were originally torn through to the skin; or in those cases where absorptive action is especially prominent as an etiological factor, and in long standing cases with a disposition to rapid tissue change, hastened, perhaps, by increased blood-pressure.

(*b*) Probably, as it appears, the most frequent seat of this venous formation is its location between the aponeurotic layer of the scalp and the pericranium. This position was indicated, macroscopically, by two *traumatic* instances (cases of Hutin and Pott), and by puncture and exploration practiced in two others (cases of Azam); and is, doubtless, most often met with in cases of this class, as well as in those of all the groups.

The *congenital* and *spontaneous* classes, although lacking the proof of direct examination, and even the uncertain evidence furnished by puncture and exploration of the interior of the sac, are, very probably, to a large extent, so situated; and especially in their early stages, and where the growth is small and does not manifest a decided or rapid tendency to increase.

(*c*) The situation of the tumor between the pericranium and the bone, and again (*d*) between the pericranium and the bone and extending internally between the skull and the dura mater, may be regarded as exceptional locations; not only on account of there being but single examples of each of these among the

present collection of cases, but also from the fact that the weight of probability, furnished by the general study of these formations, together with anatomical testimony, is against such relationships or positions. Furthermore, the etiological conditions of the two instances are diametrically opposed to each other—one being *congenital* and the other *traumatic* of long standing. In recent instances of traumatic origin, however, where comminution of the cranial tables has been produced, both the pericranium and the dura mater may be detached to a more or less extent from their bony attachments; and then one might expect to find the pericranium unglued or floated up by the blood, which had insinuated itself between the osseous tissue and this membrane, thus forming one of the layers of the tumor-wall, and even in connection with a second blood-pouch occupying a seat between the dura and the skull, although these seeming requisites of bone comminution and pericranial separation are not furnished by the histories of the above noted cases representing these locations. Should the coats of the sinus itself become dilated (phlebectasia) and protrude as a hernia through the osseous opening,—which might possibly occur where there was loss of bone substance without direct injury to the sinus; or again, if the tumor was of aneurismal production, as has been suggested, then, of course, there would exist a decided modification in the formation of the tumor; and, under such circumstances, naturally, the walls of the dilated sinus or aneurismal vein would be superadded to the constituents already enumerated as entering into the composition of the tumor coverings.

Each and all of these tunics forming the walls of the tumor may be normal in texture and in relationship to each other, or considerably modified or changed by diseased or natural processes,—even differing according to the age of the individual affected,—as is exemplified in several of the cases. Again this morbid or alterative action is not limited to the soft structures, but occasionally invades also the cranial surface,—altering it in both quality and configuration.

III. *The tumor contents.*—From what has been said relative to the causes and formation of this growth it is almost needless to remark that, the pouch contains invariably normal, liquid, venous blood.

This was demonstrated by both ante-mortem examinations by means of puncture and evacuation, and autopsies, in conjunction with the histories and symptoms of all the cases.

Moreover, solid elements may be found occasionally within its interior—as shown in one (spontaneous) of Middeldorpff's patients, where a movable, ovoid, cartilaginous-like button, about the size of a rice grain, was distinctly felt,—and which may be formed (condensed) at the expense of the cellular tissue, or even, probably, as fibrinous deposits or concretions (phleboliths) from the blood itself.

In addition the cavity of the tumor may be cellular in composition with trabeculae and cords extending across it, and illustrative of this condition is one of the cases (traumatic) of Hutin.

Finally, it is interesting to notice the difference in the tumor contents after death, revealed in the two cases of Hutin,—in one the pouch being empty, whereas in the other it was filled with a venous blood clot. Dupont endeavors to explain this difference in the contents of these tumors by the position of the head (hanging down) at the moment when life became extinct, or according to the stage of the respiratory act (expiration) at the last moment, in congesting the tumor and thus facilitating the formation of a clot.

IV. The connecting passage between the cavity of the tumor and the sinus within the cranium.—That the blood of this tumor communicates with the intra-cranial venous circulation has been clearly proven, and it has been demonstrated, also, that the means or method by which this communication is effected, is through an abnormal opening perforating the bony parietes and emerging into the skull cavity; and, therefore, it is only left now to consider the character of this passage or communication.

With those etiological and pathological facts before us which the previous study of the lesion has rendered conclusive, it is to be expected that the cranial opening will differ in the several classes or groups, and vary to a like extent in each individual case; for, taking as an example the traumatic group, which is more conspicuous than the others, the size, shape, number, and direction of the orifice is absolutely dependent upon the extent

and character of the injury producing it. Hence no definite characteristic of this aperture can be noted besides its connection or association with the sinus.

It is well to revert, however, to the fact that the communication may be either *direct* or *indirect*. The direct method, where the cavity of the tumor communicates immediately with the sinus through the cranium, is well exemplified in the *traumatic* cases of Hutin and Pott, and the *congenital* one of Busch, in each of which it was practically observed. But in the indirect communication the direction and extent of the passage is changed, or irregular—even tortuous,—and reaches the sinus only after traversing other tissues besides the bone, or it may form a distinct canal of some length. This is exhibited in one of the *traumatic* cases of Hutin, and, probably, in the *congenital* instance of Flint; in the latter the connection with the sinus being, in all probability, through the medium of a meningeal vein.

Taking the relative frequency of the direct and indirect methods of communication into consideration, although after eliminating the evidences of surgical and post-mortem demonstrations, an intelligent appreciation of the histories and symptoms presented by the cases speaks for the first or *direct* connection of the tumor cavity with the sinus.

IV. SYMPTOMS.

The symptoms can be divided into (1) general and (2) local.

I. The *general* symptoms are few in number, inconstant and variable—some patients not experiencing the slightest general discomfort or inconvenience,—and are of that character which might be anticipated from the location and nature of the tumor.

Of these *vertigo* or *dizziness* is the most prominent and most constantly present.

In the majority of instances this symptom was encountered, especially when the tumor was at its maximum volume, but not always appearing spontaneously, and more often the result of posture with the head dependent or flexed; or produced by compression of the growth, particularly if the pressure was

such as to cause the rapid emptying of the pouch of its contained blood, although, on the other hand, in some cases supporting the tumor may lessen or relieve the vertigo.

In one case (Larrey's) compression of the pouch, in addition to vertigo, caused a mistiness or indistinctness of the vision of the eye corresponding to that side on which the tumor was situated; and in one or two patients these symptoms of dizziness resulted also from any cause whatever that would produce increased blood-tension, such as a distended stomach, muscular exertion, and certain mental emotions. In two instances again nausea and vomiting, together with "lightness" and swimming of the head, came on after repeated and prolonged manipulation of the growth.

It is possible for pressure upon, or forcible reduction of, the tumor to produce symptoms of cerebral compression, as is vaguely referred to in the traumatic case of Hutin and the spontaneous case of Larrey. But, it should be added, this occurred only under certain circumstances, or in rare cases, and cannot be regarded as one of the symptoms ordinarily attending this lesion.

Pain is much less frequent than vertigo, and finds expression chiefly in the form of headache.

When present it usually accompanies increased tension of the tumor, that is when largely distended; but in some instances pain was only produced by pressure exerted upon the tumor. And in one case (Verneuil's) headache was peculiarly severe at the menstrual epochs; however, in the face of the many and varied nervous phenomena and perturbations so often met with at these periods, this symptom is of no significance.

Pain localized in, or confined to the vicinity of, the growth has not been recorded.

2. The *local* symptoms are much more characteristic and reliable than the general ones, and, for convenience of study, may be subdivided into, (*a*) symptoms furnished by inspection, and (*b*) those elicited by palpation and manipulation of the tumor, including auscultation.

(*a*) *Symptoms furnished by inspection.* The first point, and one of considerable importance, to be observed in an examination of this growth, is its *seat* or location.

As would be naturally looked for, this is situated nearly always in the tract of the sinus or adjacent thereto; and, consequently, the proximity of a swelling to the course of the superior longitudinal, or, indeed, any of the cranial sinuses, especially if presenting doubtful or obscure symptoms, should be, at least, suggestive of this variety of tumor.

An analysis of the cases shows that the growth is encountered in the frontal, parietal, and occipital regions, and these positions are distributed among the three classes as follows: The *congenital* group numbers four cases, two being in the frontal region—one to right and one to left of median line, and two in the occipital region; the *spontaneous* group includes four cases, one occupying the left side of frontal region, and three the occipital—one on left side and two in middle line; and in the *traumatic* group there are five cases, of which four were situated in the frontal—two to right of and two in the middle line, and one on the summit of the head or in the middle parietal region.

The *size* of the tumor, even when distended to its fullest capacity, is usually of moderate dimensions, the largest size being attained in the patient of MM. Nélaton and Richard ($7\frac{1}{2}$ cm. in diameter at its base by $2\frac{1}{2}$ cm. in height); and in the quiescent state, that is when the swelling is relaxed or at its minimum enlargement, the growth is quite small, and in some instances almost, if not completely, imperceptible.

These changes or alterations in the size of the tumor are especially characteristic, and can be seen frequently to take place under those conditions influencing its distension and relaxation;—the pouch slowly rising and swelling up in the dorsal decubitus or any position with the head lowered; by interference with the intra-cranial venous circulation, as occurred, for example, in two cases where the jugular veins were compressed, and in crying, coughing and sneezing; sometimes by a full stomach, muscular exertion, or mental emotions; and, possibly, during the normal respiratory effort;—however, under converse influences or these conditions lessening expansion and dilatation, the tumor is observed to recede gradually to a lower level, and often entirely disappears.

The *color* of the swelling is usually normal and does not dif-

fer from the healthy skin in the region where it is located. But, in a measure, the color is influenced by the consistency or thickness of the tegumentary coverings, and may vary with the degree of distension, for when the walls of the tumor are very thin it may assume a purple or violaceous hue, or again being changed in color whilst distended this discoloration may fade away with the relaxation of the tumor. In one case it was of a deep red, and in another there were several dark bluish spots on its surface, giving it the appearance of a capillary nævus.

As a rule the surrounding skin remains unimplicated, unless the lesion be complicated by the association of some disease of the integument—a complication much more likely to occur in the *congenital* than the other classes.

(b) *Symptoms elicited by palpation and manipulation of the tumor, including auscultation.* The influence of head posture on the volume and resistance of the tumor is even more apparent to the touch than to the eye; and, as it is manifested always, perhaps, in this affection, the symptom of *dilatation* and *reduction* produced thereby as furnished by palpation may be reasonably regarded as a pathognomonic character, and hence, should have assigned to it a position of prominence.

Without an exception, as far as tested, this influence of position was decided and marked,—the tumor being felt to attain its greatest or maximum volume when any position with the head lowered was assumed, and even simply bending the head forward producing very evident increase of size and tension; whilst the reverse attitude, with the head fixed and erect, being attended by a diminution in both resistance and bulk, and in some instances the tumor subsiding so completely as to be positively indiscernible upon the most careful palpation.

Palpation shows that a similar result is produced by *compression of the jugular veins*, or any interruption whatever of the cerebral venous circulation; and, indeed, anything which materially or decidedly increases the blood pressure, as forced expiration in coughing, muscular exertion, crying, etc., etc., as enumerated in the preceding section, would at once impart to the hand a like sensation; the contrary, of course, taking place under opposite conditions.

Although pressure upon the jugulars was employed in only two instances, the influence upon the growth was unequivocal, and may be taken as a rational symptom, and one of value when associated with additional evidences; for, it is needless to remark, its range of applicability is much too wide and extended to be by itself of diagnostic import in this form of sanguineous tumor of the skull.

Probably next in importance to postural influences may be regarded the symptoms of *compressibility* and *fluctuation*, which taken together furnish positive evidence of a fluid-containing pouch or cavity, and the fluid of which having an intracranial outlet.

In all of the cases, seemingly irrespective of cause, compressibility of the tumor was present and one of the chief characteristics,—the growth readily and completely but slowly subsiding under continuous lightly made pressure with the hand or fingers, and tardily redilating upon the removal of the compressing force,—distinctly conveying to the touch the sensation of a sac gradually being emptied of fluid. The rapidity with which this evacuation is accomplished must be dependent, necessarily, upon the freedom and directness of the communicating passage with the interior of the skull, but, as a rule, the reduction is slow and gradual.

Notwithstanding the assertion of M. Dupont (*op. cit.*) that fluctuation was observed in only two cases in his collection, I am inclined to believe, after an attentive examination of these cases, that, on the contrary, it really did exist in all of them except the patient of Azam (traumatic), in whom the tumor had a soft and spongy feel; and, therefore, I must attach a significance to fluctuation far above that which he accorded to it.

Another symptom of especial weight is the ability in many instances to recognize by the finger, after the reduction of the growth, some bone alteration, or even the depression or indentation in the skull corresponding to one or more openings leading to its interior, which in several cases were of sufficient dimension to admit the tip of the finger.

Furthermore, in a few instances *puncture* by means of a trocar and canula, with direct exploration by a stylet passed through the canula, disclosed the existence of these apertures

where they had eluded careful digital search. However, even where this latter measure was employed, failure to detect the osseous perforation resulted in one or two cases, in which a subsequent incision or post-mortem examination disclosed its presence; and hence such unsuccessful efforts to discover the communicating entrance should not be considered as conclusive of its non-existence.

The *sensation* or feel of the walls of the pouch and adjacent integument are of value in considering the symptoms of the affection. In uncomplicated cases, after the pouch was emptied, this gave to the finger the sensation of a loose, lax, movable covering of healthy tissue, of different degrees of thickness according to its constituents, with a normal feeling of the surrounding skin; but in the one instance above referred to (Azam's case) the sensation was that of a spongy mass within the skin sac.

Pulsation, although noted as occurring in the patient of Pott, may be looked upon only as an exceedingly infrequent accompaniment, and indeed, can be entirely eliminated from the list of symptoms.

The very nature of the formation, together with the anatomical characters are, under ordinary circumstances, opposed to such a symptom, and in this instance of Pott I think the pulsation was due either to a respiratory rise and fall, or, if synchronous with the cardiac action, to the cerebral pulsation imparted to it by contiguity through the fracture.

The same observation applies to a *bruit* or aneurismal murmur.

It is true that Azam claimed to have detected in one of his patients a blowing murmur; but this could not be verified by his colleagues; and, moreover, it was audible only when the tumor was quickly and forcibly reduced, and seemed to be confined to the tract or line of the sinus. In no other instance was any blood sound discoverable.

Finally, a symptom of no insignificance is the fact that, cutting off the external or superficial venous circulation, after the growth has been reduced, by means of a band or cord tightly drawn around the head, or by a ring closely encircling the base of the tumor, is followed by an immediate refilling and expan-

sion of the pouch when positions favoring or producing such expansion are assumed; and again this circular compression being applied whilst the tumor is fully distended, complete reduction is, as usual, produced by gently made pressure.

By this means the external venous blood current is largely separated from the internal or intra-cranial venous circulation, thereby enabling one to decide with which system of veins the tumor is connected.

This method was employed in but two cases. In the case of Middeldorpff it was accomplished by an ivory ring pressed down around the base of the tumor; and in the other, the patient of MM. Nélaton and Richard, a band encircling the head with graduated compresses in the temporal fossæ effected the required constriction.

V. DIAGNOSIS—DIFFERENTIAL DIAGNOSIS.

In the majority of instances the diagnosis should not offer features of grave doubt or obscurity.

The history of the lesion, especially when the result of trauma; its location, want of marked elevation, and slow progress; the usual unchanged color and texture of the integument surrounding it, and, more frequently than otherwise, of the tumor-wall itself; the direct influences of posture, coupled with those resulting from pressure exerted upon the jugular veins; compressibility of the growth—its easy and complete but slow evacuation; fluctuation; the recognition by the finger or exploring needle of bone alteration, and very often of apertures perforating the skull; the absence of both bruit and pulsation; the effect of the application of circular compression; vertigo produced by certain positions and movements; and lastly, the demonstration by aspiration or puncture of the presence of venous blood occupying the cavity of the pouch, constitute a symptom-group scarcely admitting of misinterpretation.

But, it must be remembered, this complexus of symptoms is representative of an uncomplicated or typical example of this formation, and since some cases do not exhibit them either in the prominence or clearness as here set forth, it is evident that

there must be instances where the diagnosis is not so easily determined as might appear, and in which the disease may be justifiably confounded with other tumors of the cranial vault.

It will not be amiss, therefore, to refer briefly to the principal lesions presenting symptoms in common with this one; or, at least, those which might arise for discussion in an accurate differentiation.

Thus, in the *congenital* class of this affection there are found, as bearing a certain degree of similarity, the malformations of (*a*) meningocele, and (*b*) encephalocele, to the former of which the case of Middeldorpff offered many points of resemblance; (*c*) cephalhæmatoma, as illustrated by Busch's patient; (*d*) subcutaneous venous erectile or vascular tumor (including, possibly, the capillary variety), of which the patients of Verneuil and Middeldorpff are examples; (*e*) lymphatic vascular tumor; (*f*) congenital cystic tumors; (*g*) venous aneurism, as evidenced in the case of Flint; and, under rare circumstances, (*h*) an abscess, especially where skull-perforation has taken place.

In the *spontaneous* class, the most conspicuous are, (*a*) subcutaneous venous erectile or vascular tumor of the scalp alone; or (*b*) the superficial nævus coexistent with meningocele and encephalocele,—exemplified in the patient of Larrey; (*c*) venous aneurism; (*d*) rarely, aneurism of the middle meningeal artery associated with bone erosion (Dupont); (*e*) fungus of the dura mater; and (*f*) circumscribed abscess.

The *traumatic* class presents numerous symptoms in common with, (*a*) hæmatoma, both within and without the skull,¹ of which an example is furnished by the case of Pott; (*b*) subcutaneous venous erectile or vascular tumor of the scalp, as seen in one of the patients of Azam; (*c*) venous aneurism, resemblances to which were manifested in another case of Azam and one of Hutin's; (*d*) traumatic cephalhydrocele;² and (*e*) circumscribed abscess of the scalp,—one of the cases of Hutin being mistaken for such a pus-collection.

¹ Vide cases of Guthrie and Mouton, to which reference has been made already.

² This interesting lesion is the subject of a communication by P. S. Conner, M.D., read before the Amer. Surgical Association, meeting of 1884, and published in the Amer. Jour. Med. Sci., July, 1884; and Medical News, July 19, 1884; also in Vol. II. of the Transactions Amer. Surg. Association. See also Dr. A. v. Winiwarter, Archiv für klinische Chirurgie, 1884, B. 31, H. I., who reported his case at the German Congress of Surgeons, April 19th, 1884.

A little care, however, should enable one to eliminate all questionable points; but in those instances where an individual case offers specially confusing difficulties, the demonstration of a fluid-containing-pouch, completely reducible under lightly applied pressure without producing cerebral irritation, influenced by posture and circular compression, and of which tapping or aspiration shows the fluid to consist of living venous-blood, would be quite sufficient, against otherwise doubtful or opposing symptoms, to establish the diagnosis.

VI. PROGNOSIS — PROGRESS.

As far as life is threatened, or even serious impairment of health is concerned, the prognosis is favorable, and equally so in all the classes of the disorder; but when a cure or permanent dissipation of the growth is considered, then the prognosis must be regarded in an unfavorable light, or, at least, is exceedingly uncertain. This conclusion is based upon the fact that, in all those cases where no active surgical treatment had been employed, and which were followed up for a longer or shorter period, the progress in each was slow,—there being but little tendency evinced to any increase in either bulk or symptoms.

Examining these in their respective groups, it is found that in the *congenital* class, the case of Middeldorpff progressed slowly and was almost unchanged after the space of fourteen years; and that of Verneuil also advanced tardily, and resulted in spontaneous cure after a long examination, including repeated palpations, in the seventeenth year of its existence.

This slow progress was also characteristic of the *spontaneous* class. In C. H. Mastin's patient there was only slight increase after five years; in Larrey's case it had grown but little in the twelve years subsequent to its discovery; and in the patient of Nélaton and Richard the progress was slow for twelve years, then for the next four years it grew steadily and rapidly, at which date its dimensions were increased in all directions and with the formation of an additional or secondary tumor, but without a change or increase of the symptoms previously manifested.

In the *traumatic* class, this is again borne out by the two cases of Hutin, in both of which the lesion was under careful professional observation for forty years or more, and hence the slow progress is well authenticated.

Among those instances where surgical interference was adopted are, first, the case of Flint (congenital), where death resulted from hemorrhage after free incision; secondly, the two patients of Azam (traumatic), upon whom repeated punctures were practiced for diagnostic purposes, and in which, after four years and eighteen months respectively, scarcely any change had taken place; and thirdly, the case of Percival Pott (traumatic), where incision and trephining, although attended by profuse hemorrhage, resulted in complete recovery.

Thus it has been clearly shown by these examples that, the malady, *per se*, does not incline to a fatal termination; that the affection progresses slowly in the majority of cases even where no surgical measures for controlling or repressing its growth are resorted to, and without any marked interference with the health or comfort of the patient; and furthermore that spontaneous cure is possible, and hope of recovery is held out by judicious operative interference, notwithstanding that in the case with this favorable issue the surgical procedure was undertaken without recognizing the true character of the lesion.

VII. TREATMENT.

The several methods which have been resorted to in the treatment of this variety of sanguineous tumor are to be classed into, first, the *palliative*, where protection of the part against injury or external influences, or even to limit or stay its progress, was afforded by a suitable shield or protector; and secondly, the *curative*, including (*a*) complete compression of the swelling by direct pressure, and (*b*) operative procedure.

1. Palliative measures were instituted in all the cases with only a few exceptions. And in this connection, Dr. Gross remarks: "The treatment is entirely palliative, consisting in the protection of the part from accident by the application of a

compress and suitable straps."¹ And Dupont,² also, declares that the treatment consists only in palliation.

It has been seen, however, that such methods have scarcely exerted any influence whatever over the progress of the growth.

2. (a) Firm compression as a curative measure was employed in three cases, but without success.

M. Azam, in one of his patients, after puncturing the pouch, applied steady and continuous pressure for the period of twenty days, but no appreciable impression of any kind was made upon the tumor, and the patient was discharged in an unbefitted condition. Hutin also used compression by leaden and silver plates without effect; and the efforts in the case of MM. Nélaton and Richard to dissipate the lesion by regulated pressure likewise proved futile. However, the fact must be referred to again, as being closely related to compression, that in Verneuil's patient the tumor subsided spontaneously after a prolonged examination by several physicians, during which repeated manipulation and palpation of the growth was employed.

(b) Operative interference was resorted to in but two instances, although puncture as a diagnostic test was made in two others. In the little patient of Flint a free incision was made, largely dividing the tumor, and profuse hemorrhage and death therefrom was the immediate result; and in the case of Pott, under a misapprehension of its real character, incision and trephining were employed, but was followed by prompt and permanent recovery. These two cases represent the character and extent of the operative treatment adopted; and the obvious reason why such procedures were scrupulously avoided in the management of this affection can be readily discovered in the dangers which formerly were anticipated and dreaded from the injury of any large venous trunk or branch, and especially when so intimately associated with the central nervous system as in the meningeal sinuses. Whilst these dangers must be still accorded surgical prominence in the wounding of a vein of the first magnitude,—and among the principal of these are, entrance of air, hemorrhage, phlebitis,

¹ Op. Citat., p. 28.

² Loc. cit.

resulting in thrombosis and embolism, septicæmia, and, in the present instance, grave cerebral perturbations and meningeal inflammation,—the modern system of dealing with all traumatisms, combined with our recent enlightenment of the tolerance of veins to surgical manipulation, has put quite a different phase upon many of these once feared complications. Therefore the risks of inflammatory and septicæmic manifestations do not require any special consideration in this discussion. The entrance of air is a peril which does not obtain to a greater degree in the wounding of the superior longitudinal sinus than of other important venous conduits,—those of the cervical region, for example,—and hence need not occupy us further than to mention that, in none of the cases was this accident encountered.

Hemorrhage as a notable danger is, I think, more fancied than real, or, at any rate, greatly exaggerated.

It is true that a fatal issue was speedily produced from loss of blood in Flint's case, but this occurred in the person of an infant only a few days after birth, and the knife, evidently, was used recklessly. However, in the two cases of Azam, where frequent punctures were employed; in the patient of Hulin, where incision freely opened the swelling; and in Pott's case, upon whom incision and trephining was practiced, although bleeding was profuse, it was easily and promptly controlled by simple compression. In confirmation of the comparative ease with which, as it would appear, hemorrhage from this source can be staunched, I may mention a recent paper¹ of much interest, by Mr. Hector Cameron, in which he points out that very slight pressure is necessary to stop hemorrhage from a wounded cerebral sinus. Again, as pertinent to the subject of the operative treatment, and just here to that of hemorrhage, I must refer to the unique and important case² reported by Dr. Charles T. Parkes, of Chicago, where a compound comminuted and depressed fracture of the skull over the right parietal bone was sustained, accompanied by wounding of the upper wall of the superior longitudinal sinus to the extent of admitting the end of the little finger; and upon whom at first a

¹ *Lancet*, May 24, 1884.

² *Annals Anat. and Surg.*, Vol. VIII., p. 118.

compress arrested the terrific hemorrhage, and then later the removal of osseous fragments and the introduction of three fine cat-gut sutures permanently controlled all bleeding and entirely closed the rent. Furthermore, notwithstanding that by thus coaptating the edges of the wound, the "calibre of the sinus was reduced fully one-third," and a "well-marked bulging" of the sinus taking place at the anterior extremity of the closed wound, resulting from distention by pressure of the backward blood-flow, there was not the slightest indication of cerebral disturbance¹ traceable to this marked interference with the natural movement of such a large column of blood,—the case terminating in recovery under antiseptic precautions.

Hence, in addition to the valuable lesson here taught relative to the ligation or suturing of the intra-cranial sinuses, we have positive demonstration that the brain will suffer a decided interruption in its vascular supply without evincing any appreciable alteration in its normal functions. Therefore, besides furnishing a response to several questions which naturally arise in considering the proper plan of treatment to be instituted in these venous tumors, this record of Dr. Parkes is a revelation in general cerebral surgery, and forms a strong link in the chain of facts and possibilities which continued experiment and investigation are disclosing in the surgical treatment of fracture of the skull, and diseases and injuries of its nervous and vascular contents.

Consequently, whilst hesitating in the present state of our knowledge to declare the knife and the suture or ligature as constituting the character of treatment called for in this class of venous formations, I am justified, at least, in hazarding the prophesy that the day is not in the distant future when the surgeon will resort to the same methods of treatment for wounds and diseases of the sinuses and arteries of the brain as govern him in like or similar lesions of the trunk and extremities.

¹ Nervous symptoms were present immediately after the injury, and persisted for some time, but were uninfluenced by the suture, and reduction in calibre, of the sinus.

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